the extraordinarily rapid progress the number of such failures has been comparatively small. As far as well-tried designs are concerned, it is probably safe to say that steam turbines show at least equally favourable results in the matter of general reliability and maintenance costs as those obtained on other modern prime movers.

The non-reversibility of turbines, their comparatively poor economy when working non-condensing, and their essentially high speeds of revolution have retarded the progress of their application in some directions, such as the driving of locomotives, rolling-mills, &c.

The two vital desiderata, high efficiency and low first cost per unit of power, are practically functions of the speed of rotation and output. That is to say, for a given capacity the higher the speed the lower the cost and steam consumption for otherwise equal conditions, and again for any given speed the cost and consumption will be more favourable the greater the capacity.

The limits in this direction are not only set by the driven machinery, but also by the constructional difficulties in the building of the turbines themselves, which increase in proportion to both factors.

The curves shown in fig. 10 give an approximate indication of the present-day relation between maximum speeds and capacities for land turbines, and of corresponding figures for a period of about ten to twelve years ago, based on constructional considerations of the turbines alone. The difference between the two curves represents a measure of the progress of the turbine industry during that period. It will be noted that the later curve is prolonged in both directions. This is due to the growth in capacity for which the demand has arisen, and at the other end we have the result of the introduction of high-power gearing making the turbine designer to a large extent independent of the speed of the driven machine.

In deciding as to whether it is preferable to run a direct-coupled unit at a speed below the maximum permissible for the particular output to meet a fixed speed limit of the driven machine, or whether it is preferable to interpose gearing, the first cost and the power consumption of the gearing have to be set against the corresponding savings due to

running the turbine at a higher speed.

The conditions under which it is advisable to interpose gearing between the turbine and the driven machine do not generally arise where the latter is a 50- or 6o-cycle alternator or a blower or compressor. On the other hand, in the case of direct-current units, smaller 25-cycle alternators, pumps, &c., the reverse condition holds.

It should be noted that under certain conditions efficiency is of secondary consideration, e.g. where small turbines drive auxiliary plant, and where the exhaust heat is utilized for heating, &c. Under such conditions it is usual to build turbines of the one- or two-stage type, and to run them at such a speed as the driven machine may call for.

The steam turbine has probably found its most successful field of application as a prime mover of electric generators. Sir Charles Parsons at once realized the scope for his invention in this direction, and all his earliest